Novel Technologies for Rapid Transition from Individual to Collective Protection

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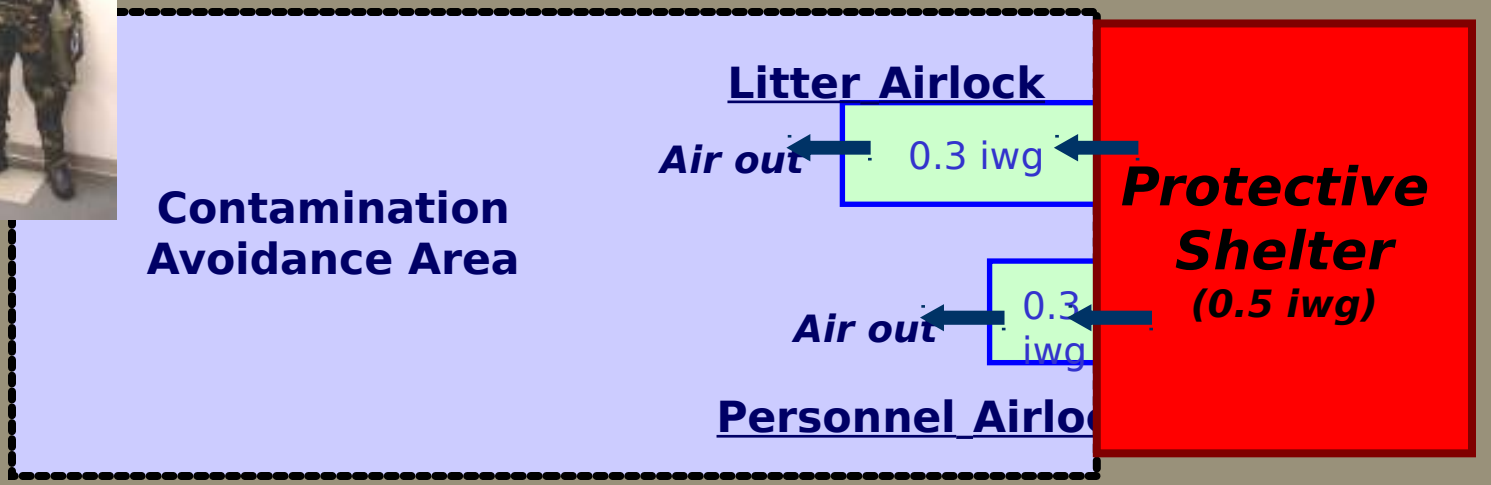
The Science Behind the Warrior:

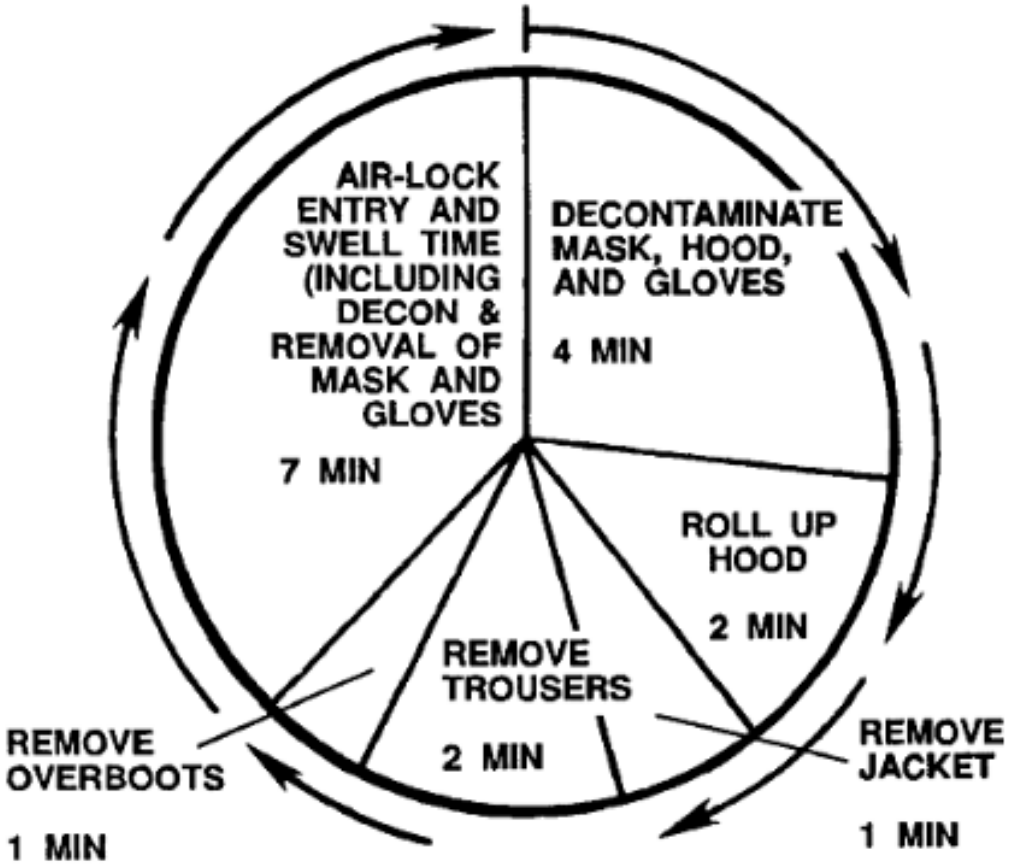
Yesterday, Today and

Current Entry Procedures



Challenge: Airlock Process Times

Table 6-5. Entry process times.

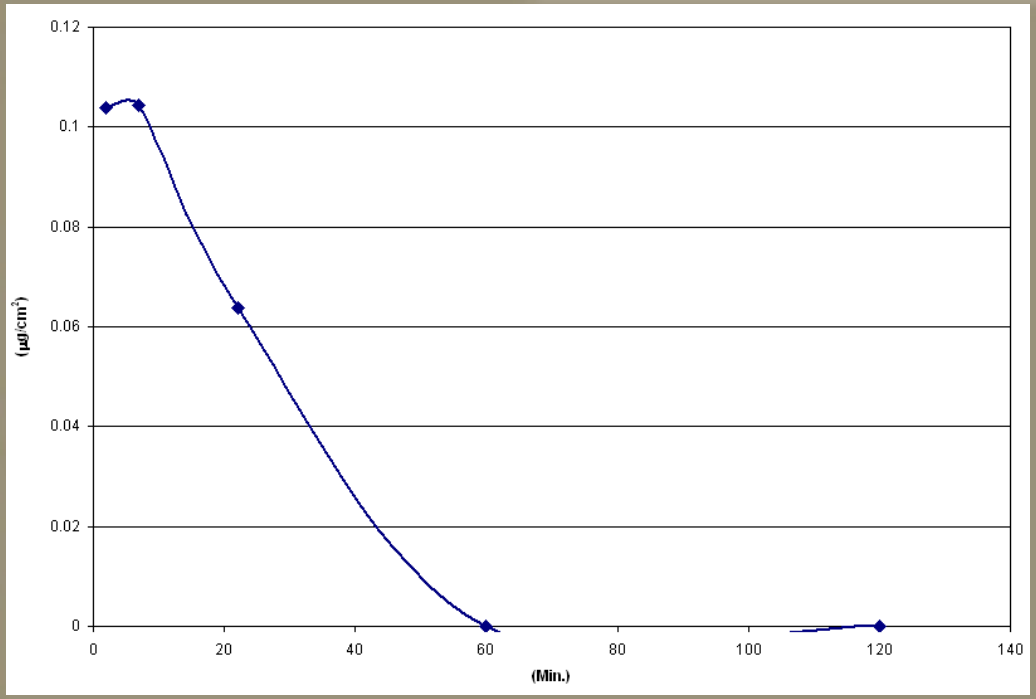


Challenge: Infiltration

- **Indirect Liquid Transfer**
  - Transferred during donning
  - Undergarments, skin, hair

- **Direct Vapor Transfer**
  - Remnant in airlock

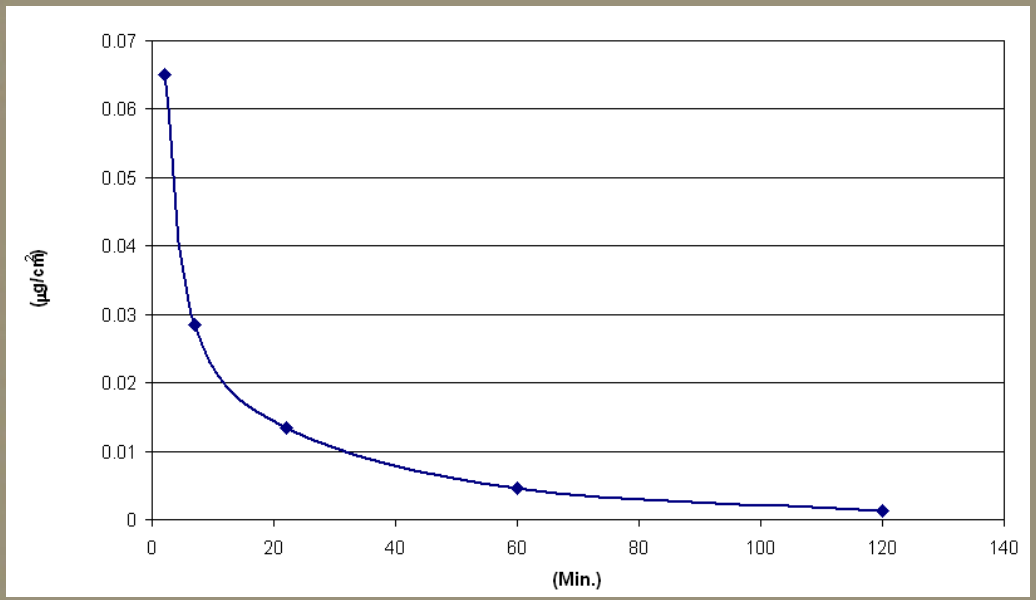
- **Desorption**
  - Five minute vulnerability
  - Adsorbed in undergarments, skin, hair



HD Desorption from BDU

5 min. Exposure

5 mg/m³



GD Desorption from BDU

5 min. Exposure

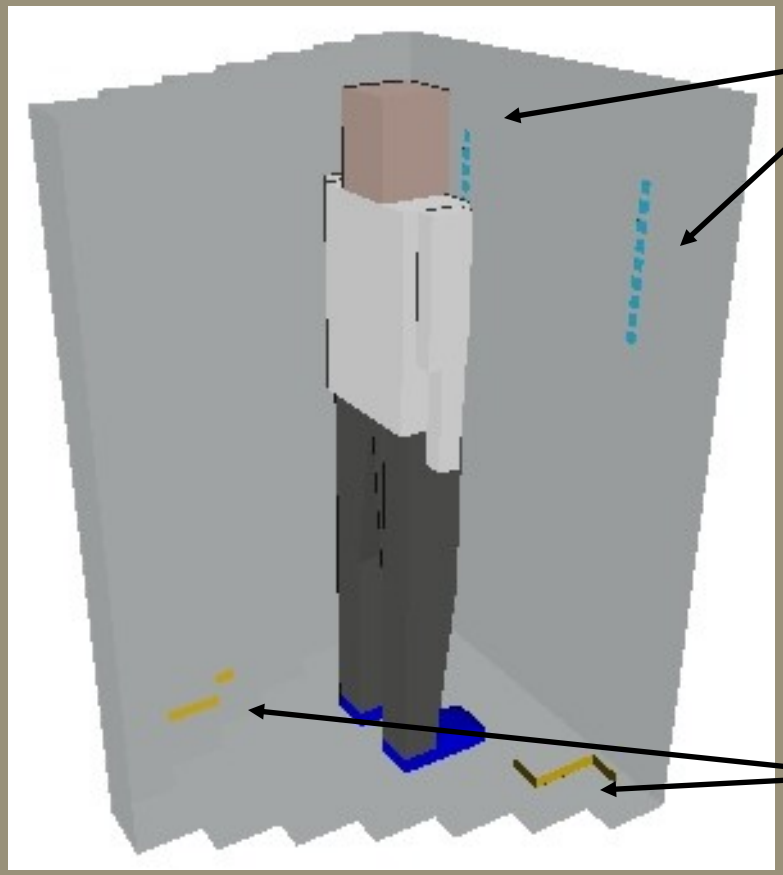
5 mg/m³

Strategy

- **Objectives**
  - Reduce Logistics
  - Increase Equipment Efficienc
  - Increase Entry/Exit Rate
- **Near Term Technical Approach**
  - Modeling and Simulation
  - Component and Assembly Re
  - Full-Scale Test and Evaluatio
- **Long Term Technical Ap**
  - Eliminate Assembly and Set-
  - Neutralize Residuals
  - Enable Rapid Entry/Exit

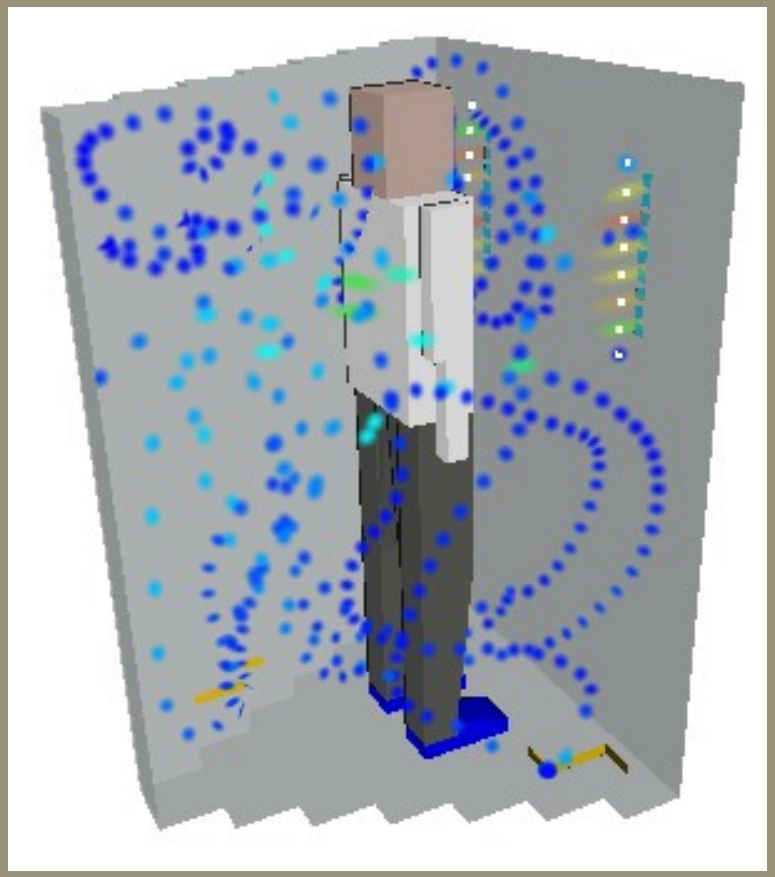
Mathematical Model

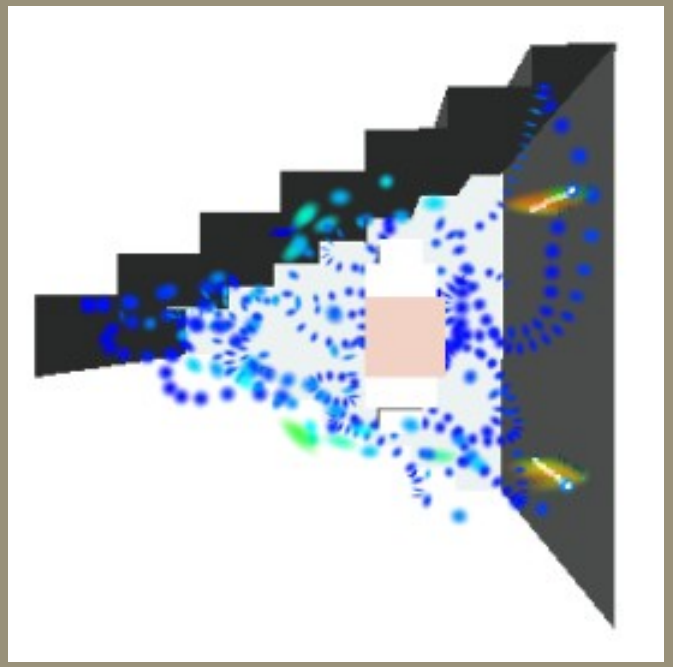
- **Baseline – M28 Protective Entrance (PE)**



Computation Fluid Dynamic Simulation

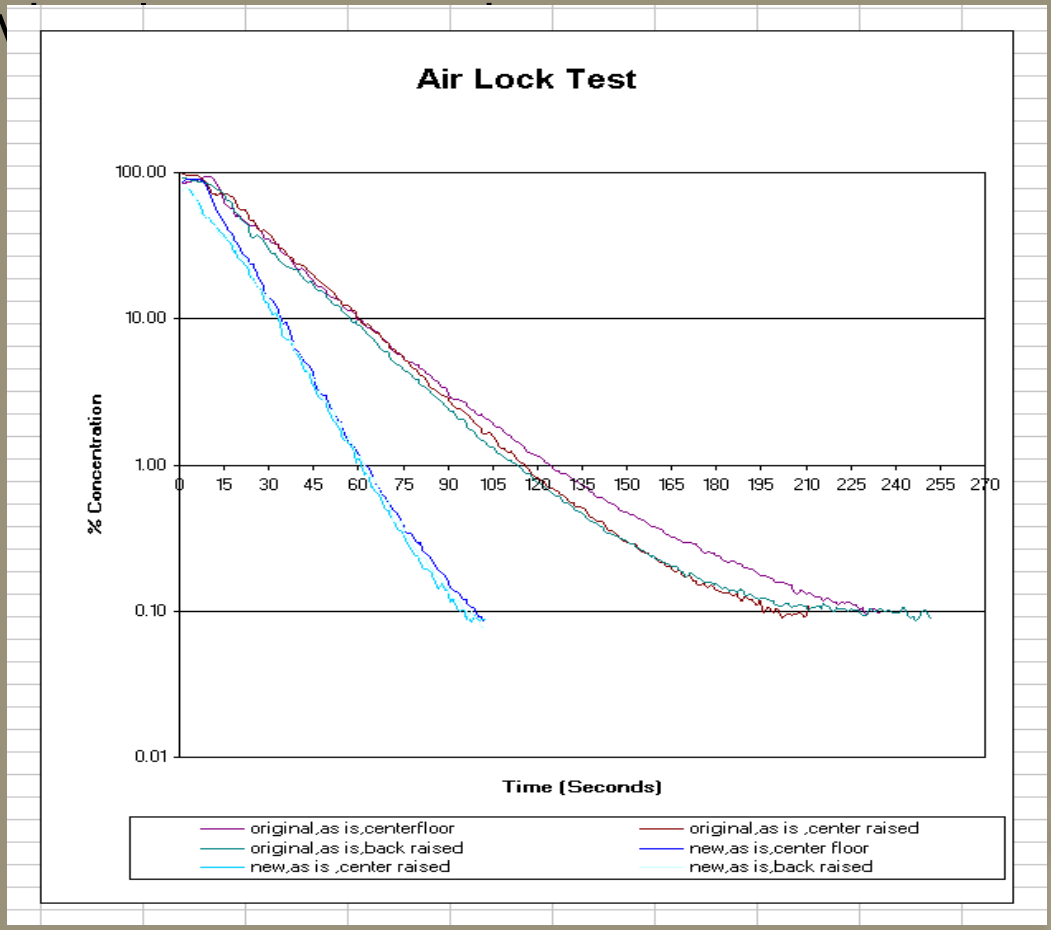
- **Baseline – M28 PE**
  - Derived from CP DEPMEDS Training Model





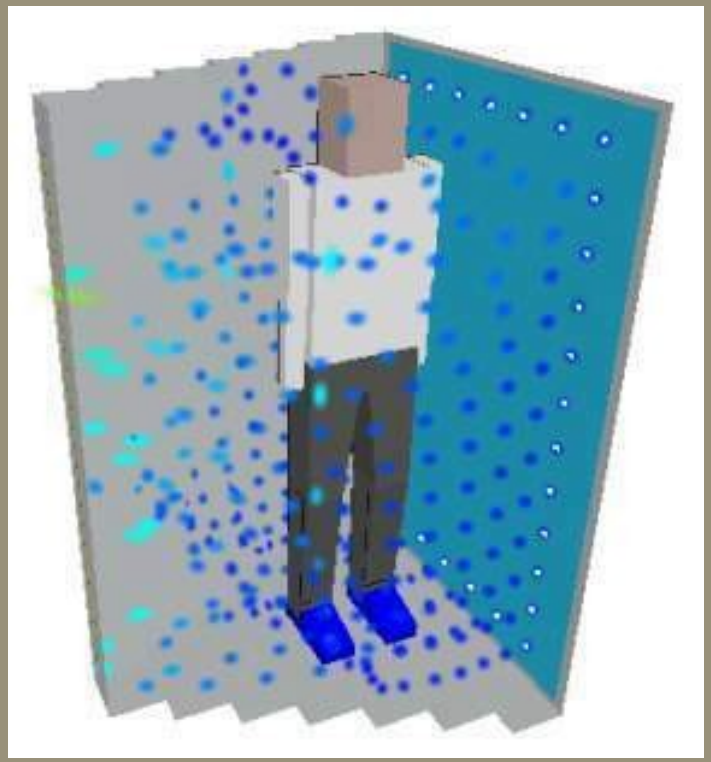
Baseline Test Set-Up

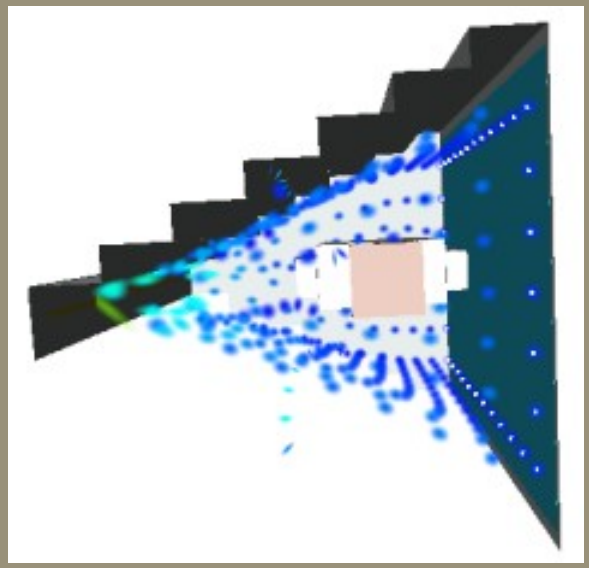
- **Standard M28 Collective Protection Equipment**
  - Comparable to prev



Airflow Management Design

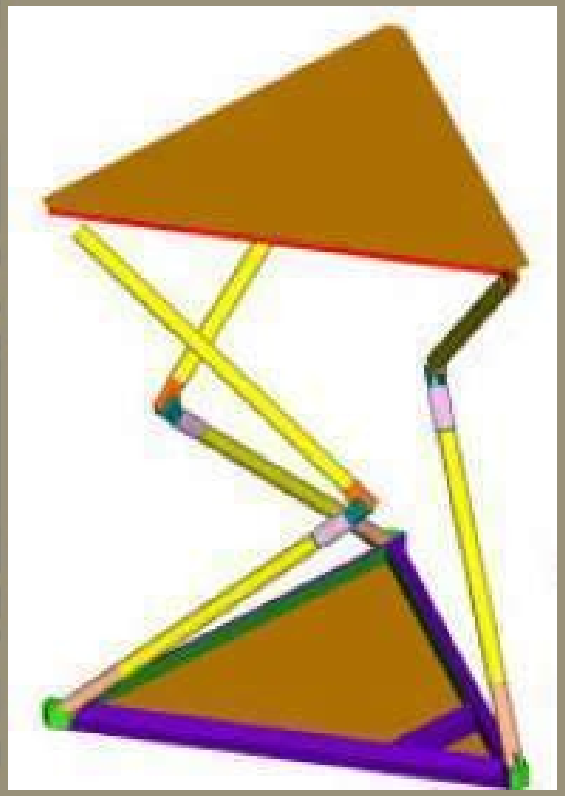
- Consistent Geometry and Supply
- Increasing Linear Velocity
- Forced Unidirectional/Laminar Flow

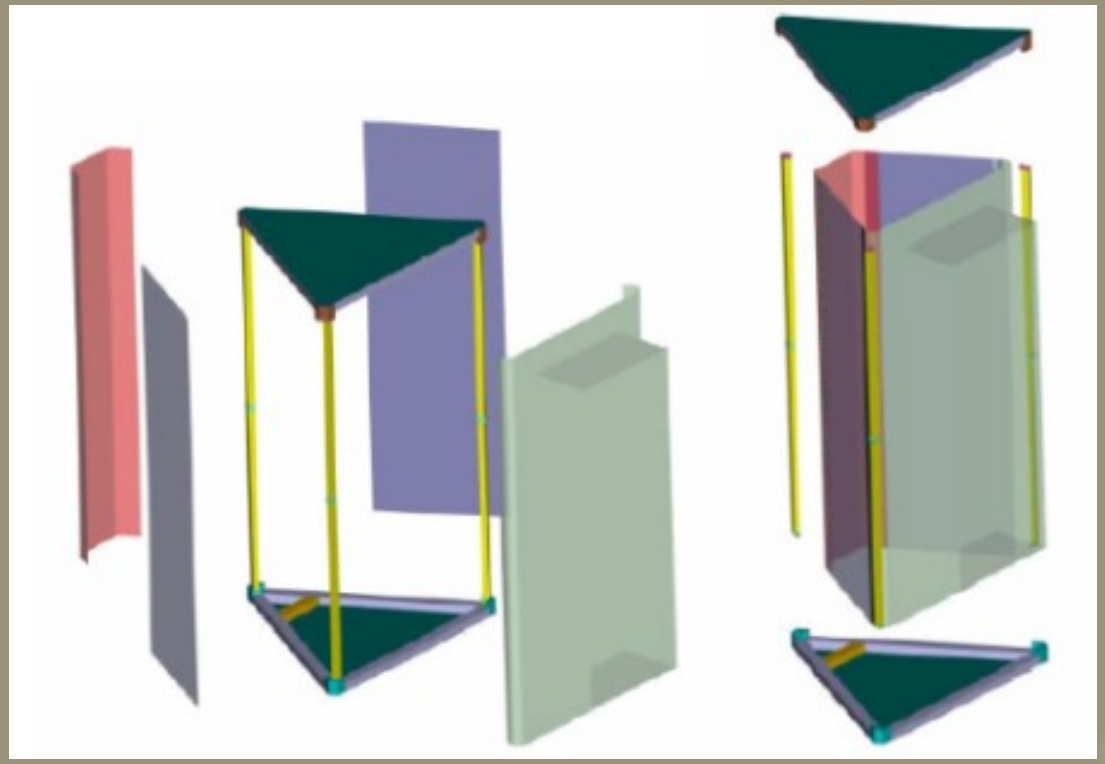




Hardware Redesign

- **Increase Ease of Use**
- **Reduce Weight and Packing Volume**





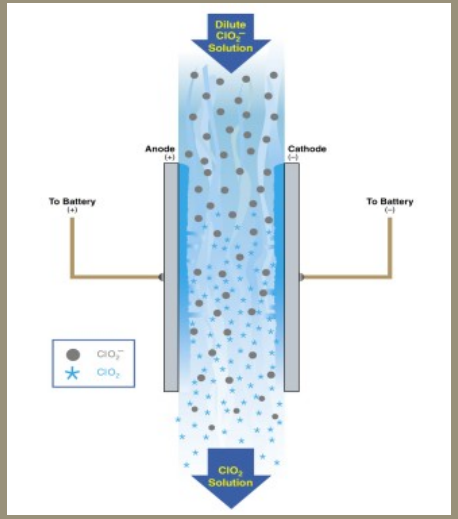
Need to Leap Ahead

Novel Neutralization Technologies

- **Neutralize Airborne Contaminants**
- **Reduce Airflow Requirements**
- **Neutralize Surface Residuals**
- **Traditional Approaches**
  - Decontamination Solution 2
  - Alcohols
  - Hypochlorite Solutions
- **Innovative Approaches**
  - Air Curtains
  - Decontamination Foam
  - Plasma
  - Photo-Destruction

Electrolyzed Water

- Procter and Gamble Technology
- Postage Stamp Sized Electrochemical Cell
- Produce ClO_2 Solution On Demand
- Shelf Stable Precursors
- Low Power Requirements
- Ability to Dial-In Concentration
- Formulation Optimization for Rapid Neutralization

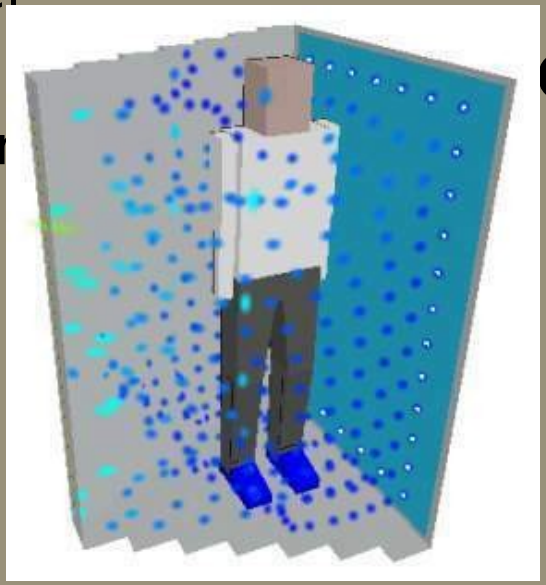


Proven Efficacy

- **Biological Surrogate Kill**
  - One Minute Contact Time
  - Complete Antimicrobial and Antiviral Kill
  - > 6 log Kill Bacillus cereus and Bacillus thuringiensis Spores
- **Chemical Simulant Kill**
  - Degradation of DECP and Malathion
  - Maintained Desired pH Levels
- **Chemical Agent Kill**
  - Complete HD and VX Neutralization
    - No Toxic Side Products
  - GD Neutralization Slow
    - Addressed with Nucleophilic Compounds

Technology Development

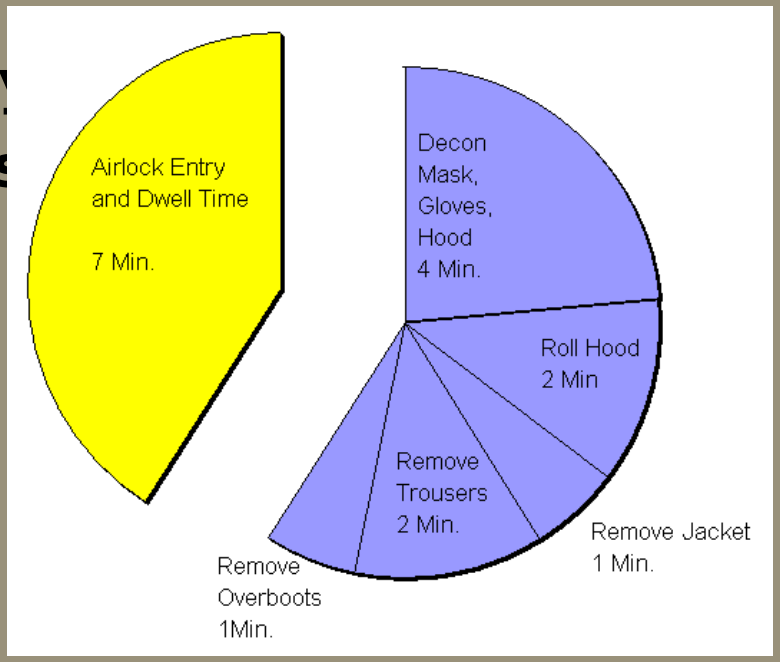
- **Airlock Application Demands**
  - Chemical and Biological Agents
  - Rapid Neutralization
  - Remain Harmless
    - Personnel
    - Patients
    - Equipment
  - Disposal



- **Formulation Optimization**
  - Reactivity & Reaction Kinetics
  - Surface Energy
  - Concentration & pH
  - Reaction Products
- **Cell Optimization**
  - Electrode Material
  - Size and Spacing
  - Surface Area
  - Power

Ultimate Goal

- **Seamless Entry**
- **No Bottlenecks**



- **Transition to ColPro Sys**
  - CBPS and CP DEPMEDS
  - Future Medical Shelter Syster
  - Joint Expeditionary ColPro
  - Future Combat System Medical Vehicle